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# EDM 465 UFPC

Ultra Fine Particle Counter

# 2013

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# Ultra-Fine Particles

## Our scientific contribution

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Limit values according to the regulations of the European Union for fine dust, PM10, and PM2.5 are still exceeded in almost all congested urban areas. But also smaller towns and communities suffer from the exceedance of these limit values, which have been set in order to protect human health, by local emission sources like industry and heavy traffic.

Apart from typical fine dust sources like traffic, industry, power plants, household emissions, agriculture and other natural sources, fine dust pollution is also determined by meteorological factors like the height of the mixing layer, wind direction and velocity, as well as the dispersion of the pollutants due to turbulences.

Government authorities are requested by their legislative to create clean air plans that aim to analyse the current situation on the one hand, and to point out the reasons and sources of limit value exceedances on the other hand. Beyond that, these clean air plans also have to present future strategies and concrete actions in order to permanently comply with the limit values for PM10 and PM2.5.

### TRAFFIC-RELATED MEASUREMENTS

Measurements close to traffic areas intend to provide cognisance of the pollution burden for citizens near streets, bus and metro stops, as well as their exposure on streets, for instance vehicle occupants. These measurement results support clean air plans and assist in reducing such pollution effectively. As long as there is no definite comprehension for this multifaceted exposure of ultra-fine particles, it is not possible to define representative measurement locations for this particle fraction. Thus the need for a suitable measurement technology for fine and ultra-fine dust, and also gaseous pollutants (before all nitrogen oxide - NO<sub>x</sub>), is increasing. Although the highest levels of exposure are on the streets, it is not practicable to regularly monitor on streets, first and foremost due to safety aspects. Thus it is necessary to find qualified measurement locations on the edge of carriageways, recognising that the areal concentration gradients close to traffic, especially for ultra-fine particles (UFP, particles < 100 nm), can be high. As mentioned above, the meteorological parameters like wind direction and velocity etc. have to be considered when assessing the extent of exposures through fine dust near traffic. Very effective is the combination of different dust measurement technologies at one location. For example, one technology for the mass determining large particles and one for the ultra-fine particles that decisively affect the particle counts. While the latter particle fraction is mostly derived from the combustion process of vehicles, the large particles originate to ca. 50% from street dust swirled up by traffic, as well as mechanical tire and brakes abrasion. This combination of state-of-the-art particle measurement technology allows to substantially assess the exposure of population groups close to streets and to find qualified and cost-efficient actions to take in order to minimise pollution effectively and permanently.

### MEASUREMENT SYSTEMS

In order to fulfill the mentioned eco-politically important regulations and actions, the company GRIMM developed various measurement systems that also account for economical aspects. One of these high-end devices is the compact and low-maintenance particle counter for **ultra-fine particles (UFP)** – the GRIMM EDM465 UFPC. The EDM465 UFPC especially counts the ultra-fine particle fraction continuously with a high temporal resolution of 1 second. Furthermore, the **Wide Range Aerosol Spectrometer EDM665** is an important part of our GRIMM Enviro product line, which additionally captures all environmentally relevant particle sizes and can also be upgraded with measurement technologies for gaseous pollutants like for, for example, **nitrogen oxides (NO<sub>x</sub>)**. An additional possibility of integrating a powerful meteorological measurement technology enables an accurate source assignment that considers for the first time also the ultra-fine particles in combination with the whole particle size spectrum and the gaseous airborne pollutants. The company Grimm Aerosol Technik, Europe's leader in ambient particle measurement technology, created with its UFP-line a new, forward-looking product line.



# GRIMM EDM 465 UFPC

## Nano Particle Counter For The Environment

### Specifications EDM 465 UFPC:

#### In dependence on the recommendations

- Europe CEN-TC264 WG 32
- US EPA-CASAC-11-001

#### Particle Counter

- Working Fluid: 1-Butanol, reservoir for 1 month continuous operation
- Sample Flow: 0.3 l/min
- Flow control: Critical orifice, temperature stabilized
- Particle size range: 7 nm (D50 with silver particles) up to 2000 nm
- Concentration range: 0 - 150,000 particles/cm<sup>3</sup> (single count mode, up to 10<sup>7</sup> particles/cm<sup>3</sup> in photometric mode)
- Relative humidity, temperature and pressure sensor
- GPS positioning
- Pressure-tight down to 200 mBar

#### Sampling System

- Sample conditioning: Isotherm
- Dehumidification: Automatic via Nafion
- Sample head: 2 µm precipitator

#### Communication Ports

- Data logger and Netbook integrated in weather protection housing
- Bluetooth and USB
- Data storage on USB flash drive
- Online data transfer (incl. meteorological data and GPS position) and via mobile network

#### Lockable Weather Protection Housing

- Temperature-controlled
- Made of stainless steel
- Thermally isolated inside
- With heater and air fan
- Dimensions(WxHxD): 49 x 65 x 28 cm
- Weight: 36 kg
- Sample pipe: 1.5 m long

#### Operating Conditions of the System

- Ambient temp.: -20°C to +50°C
- Pressure range: 200 mbar - 1,100 mbar
- Power supply: 110/220 VAC, 50/60 Hz
- Power consumption: 250 W

#### Highlights

- ✓ GRIMM CPC Condensation Particle Counter with a D50 of 7.0 nm
- ✓ Sampling with isotherm drying system
- ✓ Outdoor housing with temperature control system
- ✓ GPS positioning
- ✓ Online data system via GSM into the internet
- ✓ Powerful software package
- ✓ Concentration range 1 to 10<sup>7</sup> particles/cm<sup>3</sup>
- ✓ Additional meteorological sensors
- ✓ Automatic, unattended operation for one month

#### Applications

- ✓ Environmental studies
- ✓ Mobile aerosol studies
- ✓ Traffic emission monitoring
- ✓ Health studies
- ✓ Research

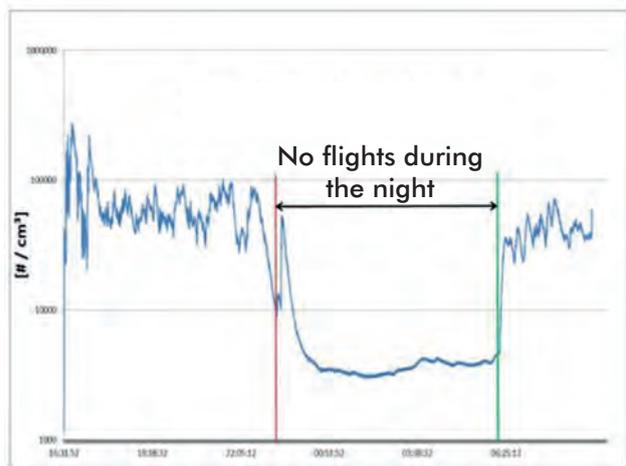


# Data Presentation

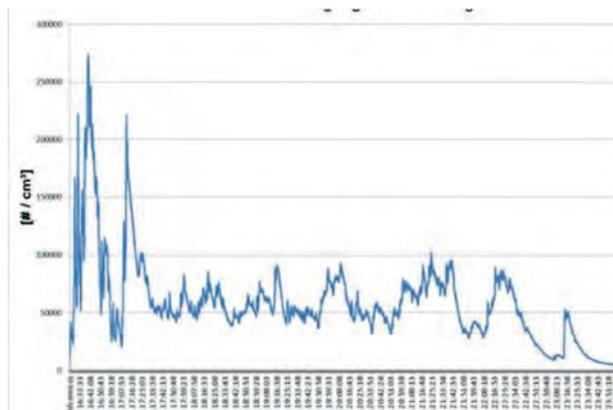
The GRIMM software for environmental instruments can present all data obtained from the instrument numerically and graphically. Data export functions to different file types, MS Excel export, different print functions as well as instrument configuration tools are implemented.

Examples of results are shown in the graphs below to give an impression of the possibilities how the data can be presented. A datalogger 1142.M5 as well as a Netbook for data read out are delivered with the instrument.

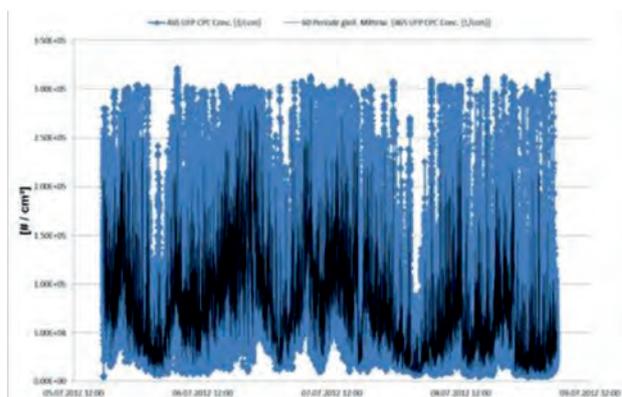
## Examples of obtained data



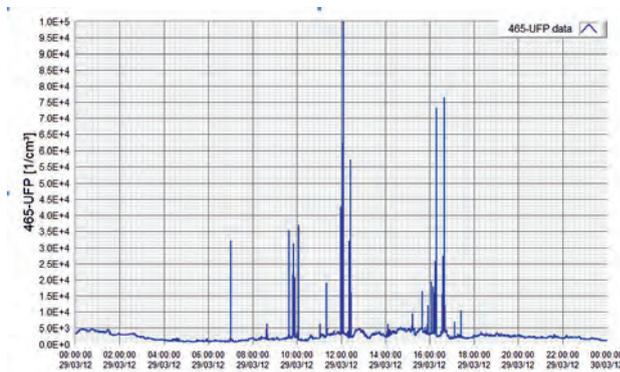
Monitoring particles at the airport Hamburg



Continuous measurement at the airfield over one day



Particle measurement at the German highway



Low concentration at a parking garage

30 years of scientific research and experience.

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